

Applicants' invention of independent claims 1 and 10 define a method for determining the storage state of an ammonia-adsorbing SCR catalyst of the type where the storing process of NH₃ causes a change in a physical property of the catalyst. The measurement according to the present invention takes place on the SCR catalyst material itself by applying a measuring pickup to the catalyst or in contact with the catalyst and determining the storage state on the basis of the results from the pickup. As an alternate embodiment, defined by independent claim 10, a material which is identical or substantially identical to the catalyst material is arranged in the exhaust gas stream in addition to the catalyst material and the change in the physical property of this substitute material based on the NH₃ storing process is sensed with the measurement taking place on the substitute material.

The present invention is an improvement of the prior art in order to determine the NH₃ filling level of the catalyst for preventing NH₃ break through so that the adsorption capacity of the catalyst will not be used up completely on account of the relatively inaccurate computation of the filling level. Thus, in prior art devices, additional storage volume must be kept in reserve, which takes up additional installation space. Prior art means to ensure correct metered amount of the reducing ammonia agent used one or more exhaust gas sensors for regulating the amount of the agent. These systems were complex and could not take into account the charging state of the catalyst which depends on many operating parameters including its previous operating conditions. The present invention dispenses with exhaust gas sensors and the accompanying complicated methods of using them. Additionally, it allows the volume of the catalytic

converter to be reduced by the portion which was previously needed in the case of open-loop control systems to allow additional adsorption based on inaccurate calculation.

Claims 1-14, 18 and 21 have been rejected under 35 U.S.C. 103 as unpatentable over the reference to Haas et al., U.S. Patent No. 5,143,696 or Schmelz, U.S. Patent No. 5,546,004 in view of Daudel et al., U.S. Patent No. 5,369,946, Kurzweil, D'Amico and Tsutsumi as indicated at item 4, on pages 2-5 of the Office Action. The primary references to Haas and Schmelz have been cited for teaching a sensor for selective determination of gases which includes an electric capacitor and for teaching a sensor for determining the gradient of ammonia concentration in waste gases, respectively. Secondary references have been cited for variously teaching exhaust gas after-treatment devices and detecting impedance of gas sensors as well as direct measurement of energy between solids and gases.

Even accepting the statement of the Examiner with respect to each of these references, there is no indication of a method for sensing a physical property of a SCR catalyst from a measuring pickup or for determining the storage state on the basis of the physical property each of which are defined by independent claim 1. With respect to independent claim 10, there is no indication in any of the references of placing a material identical or similar to the catalyst material in the exhaust gas stream and then sensing a physical property of the material and subsequently determining the storage state of the catalyst based on the physical property of the material.

Therefore, even accepting, for purposes of argument, that the references could be combined in the manner indicated by the Examiner, the present invention defined by the method of independent claims 1 and 10 does not result. Furthermore, the ability to determine the physical property of a catalyst by eliminating ammonia sensors was one of the objects of the invention and thus the present invention defines over the subject matter disclosed in the references of record.

In response to the objection to claim 13, Applicants have amended claim 13 to provide the appropriate change.

Therefore, in view of the distinguishing features between the claimed invention and the references which features are specifically defined in independent claims 1 and 10 and are not available from the references or their combinations, Applicants respectfully request that this application containing claims 1-14, 18 and 21 be allowed and be passed to issue.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #225/50125MI).

Respectfully submitted,

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Donald D. Evenson
Registration No. 26,160
Vincent J. Sunderdick
Registration No. 29,004

CROWELL & MORING, LLP
P.O. Box 14300
Washington, DC 20044-4300
Telephone No.: (202) 624-2500
Facsimile No.: (202) 628-8844
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please amend claim 13 as follows:

13. (Amended) Method according to claim 12, wherein the electrical impedance of the substitute [materialis] material is sensed.